REMARKS

In the Office Action dated December 28, 2009, and marked final, the Examiner rejects claims 1-30 under 35 U.S.C. §103(a). No claims are amended, added or canceled. After entry of this Amendment, claims 1-30 are pending in the Application. Entry and reconsideration of the Application based on the arguments presented below is respectfully requested pursuant to 37 C.F.R. §1.116.

The Examiner rejects claims 1-30 under 35 U.S.C § 103(a) as being unpatentable over Sasaki et al. (US 6,466,684) in view of Shimakage et al. (US 7,091,838). Sasaki et al. was previously cited, but Shimakage et al. is newly-cited.

Independent claims 1, 10, 19 and 25 each similarly describe a controller that computes velocity information for each pixel in an image using a sequential series of images, extracts those pixels having a velocity component based on the velocity information, wherein the velocity component comprises a movement direction and a movement velocity in a lateral direction, define regions for detecting a road boundary, detects oblique lines based on grouping those extracted pixels having a velocity component in the regions, and generates a signal indicative of a road boundary in the image based on the oblique lines.

As noted by the Examiner, Sasaki et al. fails to teach or suggest (1) computing velocity information for each pixel in the image, (2) a velocity component comprising a movement direction and a movement velocity in a lateral direction and (3) generating a signal indicative of road boundary in the image based on the oblique line, the oblique lines based on grouping those extracted pixels having a velocity component in the regions. (Office Action, p. 4). However, the Examiner contends that Shimakage et al. teaches these elements and that the combination is obvious.

Applicant submits that the Examiner fails to make a *prima facie* case of obviousness. "[R]ejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006); see also *KSR*, 550 U.S. 398, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval). The Examiner has simply copied the abstract and referred to FIGS. 7 and 8 for support that Shimakage et al. cures the deficiencies

of Sasaki et al. However, in neither the abstract nor the figures does Shimakage et al. teach or suggest (1) computing velocity information for each pixel in the image using a sequential series of images; (2) a velocity component comprising a movement direction and a movement velocity in a lateral direction and (3) generating a signal indicative of road boundary in the image based on the oblique line, the oblique lines based on grouping those extracted pixels having a velocity component in the regions. The Examiner has failed to support her conclusion with articulated reasoning by failing to articulate where in the abstract or specification any of (1)-(3) are disclosed. In particular, the Examiner states that it would be obvious to compute the velocity information for each pixel due to the combination, yet Sasaki et al. fails to disclose this and Shimakage et al. specifically states in the abstract that vehicle speed and anticipated deviation time is multiplied for a single forward observed point. It is assumed that because the Examiner requests that the applicant fully consider the references in their entirety as potentially teaching all or part of the claimed invention (see page 2 of the Office Action), the Examiner has also considered the reference in its entirety and could not cite to a part in Shimakage et al. that actually discloses that velocity information for each pixel is calculated.

Shimakage et al. fails to teach or suggest (1) computing velocity information for each pixel in the image using a sequential series of images. Shimakage et al. discloses a controller that estimates a lane deviation tendency on the basis of the vehicle speed, the present steering angle and supplied road parameters. (Col. 4, ll. 4-11). The road parameters are supplied by the camera and are parameters representative of a shape of the road. (Col. 3, ll. 40-44). Road parameters include a lateral displacement *yr* at a center of gravity of vehicle relative to the lane center line, yaw angle *§r* of vehicle relative to the lane center line, pitch angle r| of vehicle, a height h of camera system from a road surface, a road curvature (an inverse of a radius of curvature) p, and a lane width W. (Col. 3, ll. 50-55). Velocity information for each pixel in an image is not a parameter calculated and used by the controller to estimate line deviation tendency. As a matter of fact, the only time Shimakage et al. discloses using pixels from the images is during step S5, where the camera system detects the candidate point of the lane defining line in each lane-defining-line search area. The camera system counts suitable pixels that are located on the line segment and whose

densities are greater than a value capable of extracting the detection line, as shown in FIG. 8. The line segment, which includes the largest number of the suitable pixels in the whole line segments, is determined as a detection straight line. (Col. 6, ll. 51-66). Shimakage et al. goes on to provide as example of using the suitable pixels to determine the start and end of the selected line segment. (Col. 7, ll. 6-15). No where does Shimakage et al. disclose calculating velocity information for each pixel in the image using a sequential series of images.

Shimakage et al. fails to teach or suggest (2) extracting those pixels having a velocity component based on the velocity information, wherein the velocity component comprises a movement direction and a movement velocity in a lateral direction. As noted above, Shimakage et al. only "extracts pixels" during detecting the candidate point of the lane defining line. The pixels "extracted" are those located on the line segment and whose densities are greater than a value capable of extracting the detection line, as shown in FIG. 8. Furthermore, as noted above, Shimakage et al. does not calculate velocity information for the pixels. The only velocity used in the calculations by the controller is the vehicle speed, not pixel speed.

Shimakage et al. fails to teach or suggest detecting oblique lines based on grouping those extracted pixels having a velocity component in the regions. Shimakage et al. uses the number of pixels having greater than a specific density to determine whether or not there is a candidate lane-defining-line point. (See the example provided in col. 7, ll. 6-15). If there are eight (8) or more suitable pixels, the start and end of the line are treated as the candidate lane-defining-line points. If there are seven (7) or less suitable pixels, there is no candidate.

Shimakage et al. fails to teach or suggest (3) generating a signal indicative of a road boundary in the image based on the oblique lines, which are based on the extracted pixels. As shown in FIG. 7, Shimakage et al. teaches that the number of the lane-defining-line search areas is ten (10) constituted by five (5) search areas for the right lane defining line and five (5) search areas for the left lane defining line. The lane-defining-line search areas may be set at positions offset from the model lane defining lines according to the change of the past model lane defining lines. FIG. 8 shows the pixels that have the required density along the lines.

In addition to providing a combination that fails to disclose the majority of elements of the claims, the Examiner provides no teaching, suggestion or motivation to combine the references. The Examiner states on pages 4-5 that one skilled in the art would use the controller of Shimakage et al. with the controller of Sasaki et al. to better avoid potential collisions, increase accuracy of object recognition, etc. The Examiner has provided no teaching, suggestion or motivation in either reference for one skilled in the art to combine the object detection of Sasaki et al., which uses pixels of images, with the lane deviation arithmetic calculations of Shimakage et al., which uses the list of parameters noted above rather than pixels to arrive at the object detection disclosed by Applicants. Nor has the Examiner addressed how the arithmetic calculations used in Shimakage et al. to detect curves in the road using vehicle speed, vehicle yaw angle, etc., improve the object detection as claimed by the Examiner.

Shimakage et al. fails to teach the use of image pixels as recited in Applicant's claims. Sasaki et al. expressly describes an optical flow detecting method for only a portion of the pixels as shown in FIG. 12. (Col. 14, ll. 3-10). Sasaki et al. states that "the pixels whose optical flows should not be detected are removed to the maximum degree, and only the pixels constituting the forward vehicle to be detected are extracted." The monitoring range is defined by the road lane as shown in FIG. 12, which is defined before any optical flow is calculated. In other words, the road lane is already known when the process described in FIG. 13, col. 13, ll. 10-55 is performed. Sasaki et al. uses the road edges to <u>narrow</u> the search region for objects to minimize the velocity information that must be calculated. (FIGS. 13, 14A-14I, 19; col. 14, ll. 8-20 and 41-48). The Examiner fails to address how the limited use of pixels in Shimakage et al. and the teaching of Sasaki et al. of simplifying the detection process by only using a portion of pixels would suggest to one skilled in the art to use the velocity information of all pixels in an image.

Sasaki et al., alone or in combination with Shimakage et al., fails to teach or suggest the features above. For all of the foregoing reasons, independent claims 1, 10, 19 and 25 and their dependent claims are allowable over the cited references.

Applicant further submits that the cited art, either alone or in any permissible combination, fails to teach or suggest features of claims dependent from claims 1, 10, 19 and

25.

Claim 2 recites that the controller judges that oblique lines in the image are road boundaries when the vehicle is traveling and the oblique lines are positioned on the image with bilateral symmetry and respectively comprise pixels having velocity components with different movement directions. Similar features exist in claims 11, 20 and 26. Applicant respectfully submits that no movement direction for either line in Sasaki et al. is calculated or used in a determination of whether detected oblique lines are road boundaries. The Examiner cites col. 8, ll. 6-11, but all this section says is that two successive images are taken. (Office Action, p. 4). As described above, optical flow of pixels (that is, the change over time) in Sasaki et al. is not computed until after the road lane is already detected by the FOE method. Shimakage et al. fails to teach or suggest the use of pixels or the use of pixel velocity, and certainly does not disclose pixels having velocity components with different movement directions. Since Shimakage et al. fails to cure these deficiencies in Sasaki et al., these claims are allowable over the recited combination.

Similarly, and with respect to dependent claims 3, 12, 21 and 27, slopes of the oblique lines are not determined in Sasaki et al. The Examiner pointed to FIGS. 3 and 4. However, FIG. 3 is a flow diagram detailing the acquisition of an image, and FIG. 4 is a flow diagram detailing the estimation of one's own vehicle lane. Col. 9, ll. 1-15 describes this process, and nowhere is the slope of oblique lines determined. Since Shimakage et al. fails to cure these deficiencies in Sasaki et al., these claims are allowable over the recited combination.

Claim 5 describes a controller that identifies a moving object that is approaching a predicted path of the vehicle by grouping those extracted pixels having a same velocity component with the movement direction being from a side toward the predicted path of the vehicle and that generates a collision danger signal indicative of a risk of collision between the vehicle and the moving object. Similar features are included in claims 14, 23 and 29. The Examiner refers to claims 2 and 3 and FIGS. 14A and 14B of Shimakage et al. Shimakage et al. does not disclose anywhere the detection of a moving object. Shimakage et al. only discloses the detection of a lane change. The lanes do not move—the vehicle moves. Shimakage et al. clearly fails to disclose a controller that identifies a moving object. Since

Shimakage et al. fails to cure these deficiencies in Sasaki et al., these claims are allowable over the recited combination.

With respect to claim 6, 15, 23 and 29, pitch angle, among other things, is used to transform the oblique lines into a real space road model in Sasaki et al. However, the risk of collision between the vehicle and a moving object is not based on the relative positional relationship between the road boundary and the moving object as established in the real space road model. Instead, the moving object is assessed based on its optical flow, which indicates its relationship to the FOE, distance from the vehicle and the relative speed of the vehicle and object. (Col. 16, line 61- col. 17, line 4). The Examiner cites col. 9, ll. 15 and 51-64, but these sections of Sasaki et al. say nothing about, *inter alia*, the relative positional relationship between the road boundary and the moving object as established in a real space road model. Since Shimakage et al. fails to teach detection of a moving object, these claims are allowable over the recited combination.

Applicant submits that there is no teaching or suggestion of a plurality of values corresponding to collision risk levels as described in claim 7, 16, 24 and 30. Only one value N is calculated at a time to make the determination of whether to issue a warning based on system and environmental conditions. (Col. 17, line 5- col. 18, line 25). Further, claim 24 describes risk avoidance means for controlling the vehicle to avoid a collision between the vehicle and the moving object according to the degree of risk assessed by the degree of collision danger judgment means and claim 30 describes generating a signal to control the vehicle to avoid a collision between the vehicle and the moving object according to the collision danger judgment. Sasaki et al. fails to teach or suggest controlling the vehicle in any way in response to a collision danger. Instead, Sasaki et al. merely signals the driver to take action. Shimakage et al. fails to cure these deficiencies in Sasaki et al., so claims 7, 16, 24 and 30 are allowable over the recited combination.

Finally, contrary to the Examiner's position (Office Action, p. 7), neither Sasaki et al. nor Shimakage et al. teaches or suggests an automatic braking device operatively coupled to the controller and activated by a collision danger signal as required by claims 9 and 18. In Sasaki et al., the words "brake" and "braking" are never used. The Examiner cites FIG. 19 in Shimakage et al., which is described in col. 20, lines 16-52, but this section does

not disclose automatic braking. Claims 9 and 18 are allowable over the Examiner's combination.

Consideration of the Application in view of these comments is requested. It is submitted that the Application is in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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